CLAIMS

1. A dynamoelectric machine comprising:

a stator core having a plurality of slots extending axially; and

a first three-phase wye-delta hybrid winding and a second three-phase wye-delta hybrid winding installed in said slots,

said first three-phase wye-delta hybrid winding having:

a first delta-connected portion in which a first delta U winding portion, a first delta V winding portion, and a first delta W winding portion are connected in a delta shape; and

a second wye U winding portion, a second wye V winding portion, and a second wye W winding portion each connected to said first delta-connected portion in a Y (wye) shape,

said second three-phase wye-delta hybrid winding having:

a second delta-connected portion in which a second delta U winding portion, a second delta V winding portion, and a second delta W winding portion are connected in a delta shape; and

a first wye U winding portion, a first wye V winding portion, and a first wye W winding portion each connected to said second delta-connected portion in a Y (wye) shape,

said first delta U winding portion and said first wye U winding portion being housed in identical slots, said first delta V winding portion and said first wye V winding portion being housed in identical slots, said first delta W winding portion and said first wye W winding portion being housed in identical slots, and

said second delta U winding portion and said second wye U winding portion being housed in identical slots, said second delta V winding portion and said second wye V winding portion being housed in identical slots, and said second delta W winding portion and said second wye W winding portion being housed in identical slots.

2. The dynamoelectric machine according to Claim 1, wherein:

said first three-phase wye-delta hybrid winding and said second three-phase wye-delta hybrid winding are installed in said slots of said stator core so as to have a phase difference corresponding to an electrical angle of approximately 30 degrees.

3. The dynamoelectric machine according to Claim 2, wherein:

each of said winding portions is constituted by a conductor in a full-pitch winding; and

an equal number of conductors are housed in each of said slots.

4. The dynamoelectric machine according to Claim 3, wherein:

said first three-phase wye-delta hybrid winding and said second three-phase wye-delta hybrid winding are electrically connected separately to respective rectifiers.

5. The dynamoelectric machine according to any one of Claims 1 through 4, wherein:

a ratio between turns of conductors in said first wye U winding portion, said first wye V winding portion, said first wye W winding portion, said second wye U winding portion, said second wye V winding portion, and said second wye W winding portion and turns of conductors in said first delta U winding portion, said first delta V winding portion, said first delta W winding portion, said second delta U winding portion, said second delta V winding portion, and said second delta W winding portion is 1:2.

6. The dynamoelectric machine according to any one of Claims 1 through 5, wherein:

turns of conductors in said winding portions are even in number.

7. The dynamoelectric machine according to any one of Claims 1 through 4, or Claim 6, wherein:

a ratio between a cross-sectional area inside said slots of wye-connected conductors constituting said first wye U winding portion, said first wye V winding portion, said first wye W winding portion, said second wye U winding portion, said second wye V winding portion, and said second wye W winding portion and a cross-sectional area inside said slots of delta-connected conductors constituting said first delta U winding portion, said first delta V winding portion, said first delta W winding portion, said second delta U winding portion, said second delta V winding portion, and said second delta W winding portion is $\sqrt{3}$:1.

8. The dynamoelectric machine according to Claim 7, wherein:

said wye-connected conductors have a substantially quadrilateral-shaped cross-sectional area in which a radial length is a long side and a circumferential length is a short side;

said delta-connected conductors have a substantially quadrilateral-shaped cross-sectional area; and

said wye-connected conductors and said delta-connected conductors are arranged in single columns radially inside said slots.

9. The dynamoelectric machine according to any one of Claims 1 through 8, wherein:

a fan for cooling said stator winding is mounted to an end surface of a rotor rotatably disposed inside said stator; and

wye-connected conductors constituting said first wye U winding portion, said first wye V winding portion, said first wye W winding portion, said second wye U winding portion, said second wye V winding portion, and said second wye W winding portion are disposed radially further inward inside each of said slots than delta-connected conductors constituting said first delta U winding portion, said first delta V winding portion, said first delta W winding portion, said second delta U winding portion, said second delta V winding portion, and said second delta W winding portion.

10. The dynamoelectric machine according to any one of Claims 1 through 8, wherein:

wye-connected conductors constituting said first wye U winding portion, said first wye V winding portion, said first wye W winding portion, said second wye U winding portion, said second wye V winding portion, and said second wye W winding portion are disposed radially further outward inside each of said slots than delta-connected conductors constituting said first delta U winding portion, said first delta V winding portion, said first delta W winding portion, said second delta U winding portion, said second delta V winding portion, and said second delta W winding portion; and

said wye-connected conductors are housed inside said slots such that three sides of a rectangular cross section of wye-connected conductors disposed on a radially-outermost side are in close contact with inner wall surfaces with an insulator interposed.

11. The dynamoelectric machine according to any one of Claims 1 through 10, wherein:

end portions of said first wye U winding portion, said first wye V winding portion, said first wye W winding portion, said second wye U winding portion, said second wye V winding portion, and said second wye W winding portion project outward from a radially-innermost side inside said slots; and

said end portions are electrically connected to a rectifier disposed radially inside said stator by means of output wires.

12. The dynamoelectric machine according to Claim 11, wherein:

said output wires have a circular cross sectional shape.

13. The dynamoelectric machine according to any one of Claims 1 through 12, wherein:

a wye end portion of said second wye U winding portion, said second wye V winding portion, and said second wye W winding portion connected to said first delta-connected portion in a Y (wye) shape projects outward from said stator core in a straight line axially and has a rectangular cross-sectional shape;

delta end portions of said first delta U winding portion, said first delta V winding portion, and said first delta W winding portion connected to said wye end portion have a rectangular cross-sectional shape; and

said wye end portion and said delta end portions are joined together with each other by surface contact.

14. The dynamoelectric machine according to any one of Claims 1 through 12, wherein:

a wye end portion of said second wye U winding portion, said second wye V winding portion, and said second wye W winding portion connected to said first delta-connected portion in a Y (wye) shape projects outward from said stator core in a straight line axially and has a rectangular cross-sectional shape;

delta end portions of said first delta U winding portion, said first delta V winding portion, and said first delta W winding portion connected to said wye end portion have a circular cross-sectional shape; and

said wye end portion and said delta end portions are joined together with each other.

15. The dynamoelectric machine according to Claim 13 or Claim 15, wherein:

said wye end portion and said delta end portions are surrounded by a ring made of a carbon steel sheet coated with tin; and

said wye end portion and said delta end portions are joined together by pressure from said ring.

16. The dynamoelectric machine according to any one of Claims 1 through 15, wherein:

a fan for cooling said stator winding is mounted to an end surface of a rotor rotatably disposed inside said stator;

a coil end of said stator winding projecting axially outward from an end surface of said stator core comprises:

a wye coil end portion being a coil end portion of said first wye U winding portion, said first wye V winding portion, said first wye W winding portion, said second wye U winding portion, said second wye V winding portion, and said second wye W winding portion; and

a delta coil end portion being a coil end portion of said first delta U winding portion, said first delta V winding portion, said first delta W winding portion, said second delta U winding portion, said second delta V winding portion, and said second delta W winding portion; and

an axial length of said wye coil end portion is shorter than an axial length of said delta coil end portion.